COATING AND BREADING APPARATUS

BACKGROUND OF THE INVENTION

This invention generally relates to a coating machine and process for selectively dispensing a breading or other coating material onto food products, to thoroughly and adequately coat the food products therewith. More particularly, the invention is directed to a coating machine and process of coating food products with a material, wherein the machine is adapted to enable a coating material to be more effectively dispensed onto and set-up on the food product by flipping the food product over and allowing additional coating material to be applied thereto and lengthening the dwell time in which the food product is disposed in coating material within the machine.

In the field of large scale production of prepared foods, a large variety of various food products are machine coated with batter and breading or the like before being fried or cooked and packaged for purchase by a consumer. The coating materials used to coat such food products may be breading comprising dry farinaceous materials which may take many forms, but will normally include grain flour in some form. The breading material may also include seasonings, spices, shortening, etc., to form a coating which adds flavor and texture to the product. Other coating material such as ground cereal, dried vegetables or the like may be used as desired. Most breading materials may be roughly classified by their appearance into one of three classes, including flour breading, free flowing breading, or Japanese-style crumbs. Each of these various breading materials have their own peculiarities which may affect the design of a machine adapted to apply the breading material to food pieces. As an example, flour breading, which consists of finely ground dust-like particles, may have a tendency to pack under pressure, thereby increasing the chance that flow of the breading material within a coating machine will become inhibited due to congestion or packing of the breading material. Additionally, with a flour breading, a problem may exist with adequately distributing the breading material within the breading machine to achieve the desired coating characteristics uniformly for all food products introduced into the machine.

Similarly, the breadings classified as free flowing usually comprise reasonably hard and roughly spherical particles ranging in size from dust to about 3/32 on an inch in diameter and may be crackermeal or the like. A problem may exist with adequately distributing free flowing breading material within the coating machine while preventing leakage of the breading material from the coating machine. The Japanese style crumbs consist of a modified wheat flour with small percentages of yeast, salt, sugar, vegetable oil and other additives. The Japanese style crumbs appear to be dried shredded white bread having particle sizes as large as ½ inch or as little as flour size particles with a distribution of sizes therebetween. The Japanese-style crumbs contain no uniform shape and are very delicate such that the coating machine must be able to properly handle this type of breading material to avoid degradation of the quality and particle sizes thereof.

It should be recognized that the coating machine can either be constructed to handle an individual type of breading material or must be adaptable to accommodate different breading materials with different physical characteristics. In large scale food production, the coating machine must be able to handle large volumes of food pieces while effectively coating food products passing therethrough. A prior art breading machine shown in U.S. Pat. No. 4,333,415 is uniquely adapted to handle Japanese-style crumbs, and insures that both bottom and top product coating layers of breading are supplied in the proper combination of coarse and fine crumbs to uniformly coat the surfaces of food products passing through the machine. In another prior art breading machine as shown in U.S. Pat. No. 4,128,160, there is shown a construction which is especially advantageously utilized with free flowing breading material. This breading machine forms a bottom layer of breading on a moving product belt on which a battered food product to be breaded is placed. The moving belt carries the food product under a falling curtain of breading to cover the top and sides thereof, wherein a vertical screw is utilized to convey breading material to an upper hopper for proper distribution onto the tops of food products passing therebelow on the product conveyor belt. It was found in this breading machine that the use of flour breading materials was inhibited due to congestion or packing of such materials within the machine, thereby inhibiting its effective use for high volume production.

Various prior art breading machines have been proposed which are especially useful for flour breading, such as found in U.S. Pat. No. 3,647,189. In this patent, a vertical screw housing is placed at an acute angle with respect to the horizontal plane for feeding breading material to a hopper structure to generate a falling curtain of breading material to coat the upper surfaces of food products. In use with a flour type breading as the coating material, any excess breading is removed by flipping over the coated food products rather than blowing off or otherwise removing excess breading due to the possibility of generating large amounts of flour dust. The structure to facilitate the flipping over of food products is particularly shown in U.S. Pat. No. 3,860,105 which is a division of the previously identified patent. In another prior art breading machine as shown in U.S. Pat. No. 4,496,084, the construction allows flour type breading material as well as free flowing breading to be advantageously used in the machine, and includes a breading circulation system which uniformly dispenses these types of breading material on both bottom and top surfaces of food products. A hopper structure supplied with breading material from a vertical screw supplies a falling curtain of breading material to effectively coat the top surface of food products within the machine. A cross feed screw was utilized to carry excess breading material to the vertical screw for circulation to the hopper, but it was found that there was a tendency for breading material to bridge and cause congestion at the location between cross feed and vertical screws.

More recently, in pending U.S. Pat. application Ser. No. 391,477, various improvements have been made to facilitate proper and efficient coating of food products using flour type breading, free-flowing breading or Japanese-style breading material. Although the last mentioned breading machines facilitate the use of various types of breading materials, various deficiencies have been found with respect to their operation with one or the other of the particular type breading materials. For example, a problem has been found in that a